REMARKS

Reconsideration and allowance of the above-referenced application are respectfully requested.

I. STATUS OF THE CLAIMS

Claims 1 and 14-17 are amended herein.

In view of the above, it is respectfully submitted that claims 1-18 are currently pending and under consideration.

II. REJECTION OF CLAIMS 1-18 UNDER 35 U.S.C. 112, SECOND PARAGRAPH

In item 1, on page 2 of the Office Action, claims 1-18 are rejected under 35 U.S.C. § 112, second paragraph. The Examiner states that the limitation "capable of" as recited in independent claims 1 and 14-17, is not a positive limitation.

Claims 1 and 14-17 are amended herein to overcome the rejection.

Regarding claim 2, the Examiner states that the term "substantially" renders the claim indefinite. However, there is case law in which the courts have ruled that use of the term "substantially" is not rendered indefinite if there is support for its use in the specification. See MPEP 2173.05(b).

In the present application, the term "substantially" means that even if the length of a period of an etalon filter is not exactly the same as the length of a wavelength spacing, but just about the same, an adjustment can be done by adjusting the value of the locking point within the memory. In Figs. 4 and 7, for example, the lengths of wavelength spacings and the lengths of periods of an etalon filter are not exactly the same.

In Fig. 13, the length of a period of an etalon filter does not have to be exactly the same as the length of wavelength spacing, since the etalon filter has a thermal reliability characteristic. Thus, the FSR (the length of the spacing between the peaks of the transmission characteristics) of the etalon filter can be set to be equal to the length of wavelength spacing minus the thermal reliability. Moreover, in Fig. 13, even if the length of wavelength spacing is 100GHz, the FSR of the etalon filter can be 75GHz. This is since the peak of the etalon filter moves by 25GHz when the temperatures of the LD and etalon filter is changed by 8°C, simultaneously, which means that the length of the wavelength spacing and the FSR of the etalon filter need not be exactly the

same, or may be off by 25GHz (100GHz - 25GHz = 75GHz).

In view of the above, it is respectfully submitted that the rejection is overcome.

III. REJECTION OF CLAIMS 1-18 UNDER 35 U.S.C. 102(A) AS BEING UNPATENTABLE OVER CHUNG, ET AL. (USP# 6,349,103)

In item 2, on page 2 of the Office Action, claims 1-18 are rejected under 35 U.S.C. § 102(a) as being anticipated by Chung et al. (USP# 6,349,103).

Although the present invention and Chung are similar in that they both control the oscillating frequencies of the DFB lasers by utilizing etalon filters, the present invention is completely different from Chung in its method to perform control over wavelengths and in its configuration.

Chung, for example, multiplexes each of a plurality of DFB laser 10s individually with a multiplexer 20, as shown in Fig. 2, and modulates the multiplexed DFB lasers each at different values from 5 to 8 kHz, respectively, by adding a small sinusoidal current to the injection current (driving current) (col. 6, lines 10- 19). After each of the lasers is modulated at different values, the DFB lasers are cut out at desired wavelengths by the etalon filter 50, each of what is cut out is then received by the PD 60, and each of what is received by the PD 60 is individually input to the phase-sensitive detector 70. The phase-sensitive detector 70 utilizes a first derivative signal as shown by the dotted lines in Fig. 3 of Chung. Because of this, the oscillating frequency of the DFB lasers must be controlled by the phase-sensitive detector 70, with the proportional amplifier 80 and the integrator 90. (Note that the term "Photo-Sensitive Detector" in Fig. 2 should be "Phase-Sensitive Detector". This is clear from the fact that the specification of Chung uses the term "Phase-Sensitive Detector", and from the characteristics shown in Fig. 3 (col. 5, lines 1- 9)).

The present invention, however, does not individually modulate each of the driving currents of the lasers. This is because in tunable lasers which integrate a plurality of LDs, there is always oscillated only one LD.

Although the present invention and Chung are similar in that wavelengths are controlled with etalon filters, the present invention differs from Chung in that the present invention does not use a phase-sensitive detector (70), a proportional amplifier (80), or an integrator (90). More specifically, the present invention can arbitrarily control the laser diode (LD) wavelengths on the sloped part of the etalon filter, since wavelengths are controlled so that optical signal power after transmitting through the etalon filter and the optical power not transmitting through the etalon

Not in claim

filter are each individually received by the photodiode (PD), and the ratio of the two optical signals are at a constant value (see Figs. 2, 9, 15 of the Applicant's specification). Thus, the present invention does not lock the wavelength to the point where the change is 0 by using a first derivative signal like Chung.

Further, Chung appears to only lock wavelengths to the peak of the transmission characteristics of the etalon filter. This is due to the fact that Chung performs control with the use of the phase-sensitive detector 70, the proportional amplifier 80, and the integrator 90.

Since the peak of transmission characteristics of the etalon filter equals the locking point of the optical signal wavelengths, Chung applies a method of making fine adjustments on peaks of the transmission characteristics of etalon filters, as shown in Fig. 7 of Chung.

In contrast, the locking points of wavelengths are adjustable in the present invention since locking is done on the slopes of the transmission characteristics of the etalon filter. This is done by storing in the memory (shown in Figs. 2, 9, and 15 of the Applicant's specification) what value the ratio of the power of the optical signal after having transmitted through the etalon filter to the power of the optical signal not having transmitted through the etalon filter, should be controlled to be. For example, in Fig. 12, if ch. 0, 1535.82nm is to be oscillated, the value is controlled so to be (optical signal power transmitted through etalon filter)/(optical signal power not transmitted through etalon filter) = 0.4 after the LD201-1 is driven and the temperature is controlled to 16°C. In this case, the value of 0.4 is stored in the memory, and the temperature of the LD is adjusted so that the quotient of the two PDs = 0.4. This value, which decides where the locking points are to be, is stored in each of the channels 0- 32 in the memory.

Accordingly, in the present invention, it is possible to freely change the locking positions of the wavelengths back and forth. This is made possible by changing the value obtained from calculating the two PD values, which decides where the locking point of the wavelengths should be. Chung does not perform this type of control, and this type of control is unable to be realized in light of the configuration (see Fig. 2) of Chung.

Further, the present invention can not only lock 8 DFB LDs to 8 individual wavelengths, but can also lock at 4 different wavelengths in one LD, so that a total of 32 different wavelengths can be output. In order to realize this, the present invention makes fine adjustments on wavelengths by using driving currents of LDs, differentiates the FSR of the etalon filter from the length of wavelength spacing, and utilizes the slope parts of the transmission characteristics of a plurality of etalon filters.

In light of the above, the present invention and Chung are different in how they perform control over optical wavelengths, although they both utilize the periodic characteristics of the etalon filter to control wavelengths. Therefore, Chung does not disclose or suggest the claimed controlling means as recited in claims 1 and 14-17 of the present application.

In view of the above, it is respectfully submitted that the rejection is overcome.

IV. CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that each of the claims patentably distinguishes over the prior art, and therefore defines allowable subject matter. A prompt and favorable reconsideration of the rejection along with an indication of allowability of all pending claims are therefore respectfully requested.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please AMEND the claims in accordance with the following:

1. (TWICE AMENDED) A device comprising:

a light source having a plurality of lasers [capable of oscillating] to oscillate at a plurality of wavelengths;

an etalon filter having a periodic transmittance-wavelength characteristic for receiving laser light output from said light source;

light detecting means for receiving laser light output from said etalon filter and detecting light intensity of the received laser light; and

controlling means for generating oscillation of any one of said plurality of lasers at a desired wavelength, and for controlling an oscillation wavelength of the laser so that an output value of said light detecting means becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths.

14. (TWICE AMENDED) A device comprising:

a laser [capable of oscillating] to oscillate at a plurality of wavelengths;

an etalon filter for receiving laser light output from said laser, which transmittance-wavelength characteristic is temperature dependence in accordance with temperature dependence of an oscillation wavelength of said laser;

light detecting means for receiving laser light output from said etalon filter and detecting light intensity of the received laser light; and

controlling means for generating oscillation of said laser at one of said plurality of wavelengths, and controlling an oscillation wavelength of laser light output from said laser so that an output value of said light detecting means becomes equal to a target value that is set for each of said plurality of wavelengths.

15. (ONCE AMENDED) An apparatus, comprising:

a light source having a plurality of lasers [capable of oscillating] to oscillate at a plurality of wavelengths;

an etalon filter having a periodic transmittance-wavelength characteristic to receive laser

light output from said light source;

a light detecting unit to receive laser light output from said etalon filter, and to detect light intensity of the received laser light; and

a control unit to generate oscillation of any one of said plurality of lasers at a desired wavelength, and to control the oscillation wavelength of the laser so that an output value of said light detecting unit becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths.

16. (ONCE AMENDED) An apparatus, comprising:

a light source having a plurality of lasers [capable of oscillating] <u>to oscillate</u> at a plurality of wavelengths;

etalon filters, each having a periodic transmittance-wavelength characteristic to receive laser light output from said light source;

light detecting units to correspond to said etalon filters, respectively, to receive laser light output from said etalon filters, and to detect light intensity of the received laser light; and

a control unit to generate oscillation of any one of said plurality of lasers at a desired wavelength, and to control the oscillation wavelength of the respective laser of said plurality of lasers so that an output value of the respective light detecting unit becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths.

17. (ONCE AMENDED) An apparatus, comprising:

a light source having a plurality of lasers [capable of oscillating] <u>to oscillate</u> at a plurality of wavelengths;

a light detecting unit to receive laser light output from an etalon filter, and to detect light intensity of the received laser light; and

a control unit to generate oscillation of one of said lasers at a desired wavelength, and to control the oscillation wavelength of the laser so that an output value of said light detecting unit becomes equal to a target value corresponding to said desired wavelength.